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Contributions to the knowledge of North American Sphagna. III.

C. WARNSTORF.

B. *Branch leaves with pores and fibrils.*

1. Branch leaves ovate-lanceolate, lanceolate to almost long-linear.

a. Stem leaves in the upper part with resorbed membranes, and therefore the apex lacerate-fimbriate.

α. Stem leaves widened upward, spatulate, and fringed at the broad rounded apex, like *S. fimbriatum*.

13. *S. Lindbergii* SCHPR. Entw.-Gesch. d. Torfm. p. 67, no. 6 (1858).

Syn: *S. cuspidatum* β. *fulvum* Sendt. MSS. 1838.

New York, Canada, Newfoundland, Greenland, Miquelon Island (*Delamare*).

β. Stem leaves triangular-linguiform, lacerate two-cleft at the apex.

14. *S. riparium* AONGSTR. in Oefvers. V. Ak. Handl. 21, p. 198 (1864).

Syn.: *S. cuspidatum* γ. *speciosum* Russ. Beitr. p. 57 (1865).

S. speciosum v. Klinggr. (1872).

S. spectabile Schpr. Synops. 2d ed. p. 834 (1876).

Greenland, New Herrenhut (*Spindler*); Kotzebue Sound, N. W. America (*Seemann*, Herb. *Mitten*); New Jersey; New Hampshire, Crawford House, 1,900 ft. (*Faxon*).

This beautiful, most characteristic species must surely be common in North America, but has hitherto been mostly overlooked or not distinguished. Lindberg regards it, in Hvit-mossor, as merely a sub-species of *S. cuspidatum*; Cardot only mentions it, in Rév. des Sphaignes, in connection with *S. cuspidatum* var. *Miquelonense* Ren. et Card. Miss Cummings does not include it in her Catal. of Musc. and Hep. of N. America, and passes over it in silence.

S. riparium is, with the exception of *S. cuspidatum*, var. *Torreyanum*, the stateliest of all the CUSPIDATA, and sometimes attains to the size of the strong forms of *S. squarrosum*. It is always easily and certainly distinguished from all the other species of this group by the stem leaves which are tri-

angular-linguiform, always lacerate two-cleft at the apex and without fibrils, as well as by the large membrane-gaps on the outer side of the leaves of both kinds of branches or only of the pendent ones, in the upper angles of the cells.

b. Stem leaves either with isolated membrane-gaps on both surfaces at the extreme tip only, or entirely without them. Fibrils sometimes present, sometimes absent.

a. Stem leaves mostly small, equilateral-triangular to short isosceles-triangular and pointed, or triangular-linguiform and obtuse, mostly nonfibrillose, rarely fibrillose in the apical part. Branch leaves narrowly bordered; on the inner side with numerous round pores in nearly all the cell angles, on the outer side near the apex almost free from pores, or with single or numerous small, imperfectly ranged pores on the commissures, but in the middle and lower part of the leaf near the margins with rather large pores in the upper cell-angles.

15. *S. recurvum* (P. B.) RUSS. ET WARNST. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Syn.: *S. intermedium* Hoffm. Deutschl. Fl. 2, p. 22 (1796), according to Lindb., Braithw. and others.

S. cuspidatum Ehrh. C. Müll. Synopsis I. p. 96 (1849).

S. pulchricoma C. Müll. Synops. I. p. 102 (1849).

? *S. flexuosum* Dz. et Mlk. in Prodr. Fl. Batav. 2, P. 1, p. 76 (1851).

S. variabile Warnst. var. Europ. Torfm. p. 60 (1881).

S. Serræ C. Müll. 1889 in litt.

Var. *pulchrum* LINDB. in Braithw. Sphagn. of Eur. and N. Am. (1880).

A stately, beautiful form. Stem leaves triangular, pointed, with or without fibrils in the apical part. Branch leaves mostly closely imbricate, when dry slightly undulate, when moist distinctly five-ranked, broad-lanceolate, rather abruptly contracted into a short narrowly truncate dentate point. Color of the tufts varied, the heads often fine yellowish brown or dirty brown, and the other parts green or blanched.

Miquelon Island (*Delamare*); New Jersey (*Austin*); New Hampshire, Crawford House, 1,900 ft. (*Faxon*).

Var. *mucronatum* RUSS. as subsp. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Stem leaves mostly small, triangular, acuminate and without fibrils, or in the hemiisophyllous forms larger, isosceles-triangular and with fibrils in the apical part. Branch leaves lanceolate, longer-pointed, when dry beautifully undulate and with recurved points, when moist not obviously five-ranked. Color green, whitish or in the heads pale yellowish.

Mass. Boston, Brookline and Bedford, 50 to 100 feet (*Faxon*).

Var. *amblyphyllum* Russ. as subsp. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99

Similar to the preceding var. and differing from that only by the stem leaves which are triangular-linguiform and furnished at the rounded apex with isolated membrane-gaps, and nearly always without fibrils. Here belongs *S. pulchricoma* C. Müll.

N. H., Crawford's, 1,900 ft., Franconia, 1,000 ft.; Mass., Boston, Dedham and Brookline, 50 to 100 ft. (*Faxon*).

Var. *parvifolium* (SENDT.) WARNST. in Flora 1883, p. 374.

Syn.: var. *tenue*, v. Klinggr. (1872).

var. *angustifolium* C. Jens. 1884 in litt.

var. *gracile* Gravet, Warnst. Europ. Torfm. p. 67 (1881).

subsp. *angustifolium* (Jens.) Russ. in Sitzungsber. d. Dorpater Naturf.-Ges. 1889, p. 99.

Tall and slender, or in lower compact tufts. Stem cortex usually not clearly distinct from the wood cylinder. Stem leaves small, triangular-linguiform, not fibrillose or toward the apex fibrillose. Branch leaves small, slightly undulate or even without a trace of undulation; in the latter case mostly densely imbricate, the plant then being in habit quite similar to *S. acutifolium*. On the outer side of the apical half with small imperfectly ringed pores on the commissures, which in the preceding varieties are almost entirely wanting. Leaves of the pendent branches with large membrane-gaps in the upper angles of the cells.

New Hampshire, Crawford House, 1,900 ft., Franconia Notch, 2,000 ft. (*Faxon*).

The species nearest related to *S. recurvum* is the before-mentioned *S. obtusum* Warnst. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99. The latter is distinguished from *S. recurvum* chiefly by the stem leaves larger, linguiform, not fibrillose, and somewhat fimbriate at the rounded apex, also by the occurrence, on the outer side of the branch leaves, in greater or less number, in one or two rows, of very small pores with ill-defined outlines which, as already mentioned, can only be made visible by intense staining. In this connection I would suggest that it is only by staining the leaves that one can form a safe judgment concerning the relationships of the *Sphagna* with respect to their pores which usually are quite different on the two surfaces of the leaf. *S. obtusum* sometimes attains to the size and strength of *S. ri-*

parium; I have not yet seen specimens from N. America, but I do not for a moment doubt that it will be found there in swamps on the shores of lakes and ponds.

β. Stem leaves larger, isosceles-triangular, usually with fibrils in the apical part. Branch leaves broadly bordered and mostly involute far down on the margins; on the inner side with few or many pores in the cell-angles, on the outer side with only small pores in the upper angles of the cells.

16. *S. cuspidatum* (EHRH.) RUSS. et WARNST. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Syn.: *S. cuspidatum* β. *plumosum* Bryol. Germ. I. p. 24 (1823).

S. cuspidatiforme Breutel in Flora 1824, p. 437.

S. hypnoides (A. Braun) Bruch in Flora 1825, p. 629.

S. laxifolium C. Müll. Synops. I, p. 97 (1849).

S. Torreyanum Sull. in Mem. Am. Acad. n. s. iv., p. 174 (1849).

S. cuspidatum β. *submersum* et γ. *plumulosum* Schpr. Entw.-Gesch. der Torfm., p. 61 (1858).

S. variabile Warnst. var. 2, in part, Europ. Torfm. p. 69 (1881).

S. Naumanii C. Müll.

S. Bernieri Besch. (1879).

S. Gabonense Besch. (1883).

S. falciculatum Besch. (1885).

Var. *Torreyanum* (SULL.).

Syn.: *S. cuspidatum* var. *Miquelonense* Ren. et Card. in part, Rév. des Sphaignes de l'Amérique du Nord (1887).

Of all the forms of *S. cuspidatum* the most stately and robust. Stem leaves large, isosceles-triangular, acuminate or obtusish, broadly and almost uniformly bordered to the base, free from fibrils or with rudiments of fibrils in the upper part. Branch leaves very large, long-lanceolate, 4 to 5 times longer than broad, tubular-concave, broadly bordered, dentate only at the truncate point; when dry usually secund falcate and slightly undulate; entirely free from pores on both sides of the leaf.

Essex Co., N.Y. (*Torrey*). Miquelon Island (*Delamare*). Mass., Milton, 500 ft., Brookline, 100 ft. (*Faxon*).

Var. *Miquelonense* REN. ET CARD. in part, l. c.

Plants strong but weaker than in var. *Torreyanum*. Stem leaves rather large, triangular-linguiform, dentate at the usually obtuse apex, edges with a broad border much widened downward, mostly without fibrils, rarely with rudiments of fibrils near the apex; on the outer side with large, roundish or longish-oval membrane-gaps. Branch leaves large, wider

or narrower, long-lanceolate, when dry faintly undulate and more or less falcate, above tubular-concave, at the edges broadly bordered by 5 to 8 rows of narrow cells; on the inner side with numerous pores in nearly all the cell angles, becoming gradually smaller toward the base; on the outer side the pores are more scanty, especially in the lateral angles of the cell, sometimes one very strong-ringed pore in the upper angle of the cell, the larger pores often with imperfect rings, becoming gradually larger toward the base of the leaf.

Miquelon Island (*Delamare*); Mass., Milton, 500 ft. (*Faxon*), Essex Co., 100 ft. (*Robinson*).

Chiefly distinguished from var. *Torreyanum* by the pore-structure of the branch leaves.

Var. *falcatum* RUSS. Beitr. p. 59, 1865.

N. Jersey (*Austin*); Miquelon Island (*Delamare*); Mass., Bedford, 100 ft. (*Faxon*).

Var. *submersum* SCHPR. Monogr. et Synops., ed. I.

Louisiana (*Langlois*); Mass., Boston, Brookline and Bedford, 50 to 100 ft. (*Faxon*).

Var. *plumosum* BRYOL. GERM. I., p. 24 (1823).

N. Jersey (*Austin*); Mississippi (*Langlois*); Mass., Boston, 75 ft. (*Faxon*).

Undeveloped plants of this variety often exhibit broadly truncate branch leaves, coarsely dentate at the apex and denticulate on the margins; these constitute the var. *serrulatum* Schlieph. Beitr. p. 15 (1865). Whether these plants are identical with *S. serratum* Austin, I can not determine, for hitherto I have been unable to obtain an original specimen of this form; that which I have received under this name from the Kew Herb. proves to be *S. Floridanum*. C. Müller recently cites Austin's moss as a synonym of his *S. Trinittense*, which I retain provisionally as a separate species, distinct from *S. cuspidatum* on account of the invariably divided hyaline cells of the stem leaves.

- γ. Branch leaves on the inner surface almost always without pores; on the outer side with numerous larger or smaller apertures in one or two rows in the middle of the cell-wall or near the commissures, which always have sharply defined outlines and frequently in the apical half of the leaf become large membrane gaps. Stem leaves large, triangular-linguiform, almost always fibrillose near the apex.

17. *S. Mendocinum* SULL. et LESQ. in Sulliv. Icon. Musc. Suppl. p. 12 (1874).

SYN.: *S. laricinum* Aongstr. in Oefvers. V. Ak. Förh. 21, p. 197 (1864).

S. cuspidatum var. *Dusenii* C. Jens. (1886 in litt.)

S. cuspidatum var. *Nawaschini* Schlieph. (1888 in litt.)

S. cuspidatum var. *porosum* Schlieph. et Warnst.

S. obtusum Warnst. var. *Dusenii* (C. Jens.) Warnst. in Samml. Europ. Torfm. No. 97 (1888).

S. Dusenii (Jens.) Russ. et Warnst. in Sitzungsab. der Dorpater Naturf.-Ges. 1889, p. 99.

California (*Brewer*): N. Hampshire, Ethans Pond, Mt. Willey, 2,500 ft. (*Faxon*).

The occurrence of numerous pores on the outer side of the branch leaves has led Aongström to refer this characteristic species to *S. laricinum* (Spruce) and therefore to place it in the SUBSECUNDA. Lesquereux and James also erroneously place it in the SUBSECUNDA (Manual p. 20). I myself also, in 1881, in Die Europ. Torfm. p. 90, committed the mistake of designating specimens of Aongström's *S. laricinum* as var. δ . *Lapponicum*. This type, however, belongs unquestionably to the CUSPIDATA, and moreover in habit has the greatest resemblance to *S. cuspidatum* (Ehrh.) Russ. et Warnst.

By the presence on the outside of the leaf of larger or smaller pores with sharply defined outlines, as well as by the triangular-linguiform stem leaves, nearly always fibrillose at the apex, this species is easily and certainly distinguishable both from the forms of *S. cuspidatum* and from *S. obtusum*.

δ . Branch leaves comparatively large linear-oval, distinctly dentate at the broad truncate apex as well as on the upper margins nearly to the middle, border very narrow, edge not involute; on the inner side with single small pores in the cell-angles. Stem leaves large to very large, narrow, elongate-oval, concave, with an almost cucullate, truncate, dentate apex, narrowly and uniformly bordered to the base, abundantly fibrillose throughout, the lateral margins involute far downward.

18. *S. Fitzgeraldi* RENAULD in Lesq. & James Manual, p. 23, 1884.—Ren. et Card. in Rev. Bryol. 1885, p. 46.

Florida, on decaying stems and leaves of palms (*Fitzgerald*).

This extremely soft and slender plant which was collected in fruit by Fitzgerald has a very small hemispherical capsule with triangular-thickened cell-angles. The tetrahedral spores are large and measure in diameter 0.038 mm. They are pale and appear broad-edged and with the surface fur-

nished with a branching network of bands, as in certain species of *Fossombronia* and *Riccia*.

- e. Branch leaves very long and narrow, almost linear, flat, broadly bordered by 4 to 6 rows of narrow cells, margin dentate to the base, apex broad-truncate and dentate. Pores on the outer side situated solely in the upper angles of the cells, or sometimes in the upper and lower, and very small. Stem leaves large, narrow isosceles-triangular, dentate at the truncate apex, with a broad border almost equally broad to the base; every hyaline cell divided by an oblique cross-wall, fibrillose to the base of the leaf; arrangement of pores the same as in the branch leaves.

19. *S. Trinitense* C. MUELL. Synops. I. p. 102 (1849).

Syn.: *S. serratum* Austin in Bull. Torr. Bot. Club, p. 145 (1877) according to C. Müller, Flora 1886.

S. cuspidatum, var. *serratum* (Aust.) Lesq. & James, Manual, p. 15 (1884).

Florida (*Fitzgerald*).

This species, an original specimen of which I have been able to examine, seems in habit very similar to a feeble *S. cuspidatum* var. *plumosum*, and also in most points agrees with that form in anatomical structure. It seems to me, however, remarkable that all the hyaline cells of the stem leaves are always divided by a cross-wall in *S. Trinitense*, a condition which I do not remember ever to have observed in the forms of the genuine *S. cuspidatum*; in the latter, indeed, cross-partitions of the hyaline cells of the stem leaves also occur, but only isolatedly. Although therefore I must admit that *S. Trinitense* (*S. serratum* Austin) stands extremely near to *S. cuspidatum* var. *plumosum* f. *serrulatum* Schlieph., nevertheless I am inclined to treat the former provisionally as a type distinct from *S. cuspidatum*, on account of the invariable cell-division in the stem leaves. A final decision can only be reached when more abundant material for investigation shall be at our disposal.

III. *Sphagna squarrosa*.

20. *S. squarrosus* PERS. MSS. Sw. in Schrad. Journ. Bot. 1800, I, P. 2, p. 398.

Syn.: *S. latifolium* β . *squarrosus* Wahlenb. Fl. Upsal. p. 391 (1820).

S. cymbifolium, var. *squarrosus* Bruch MSS. Bryol. Germ. I, p. 11 (1823).

S. teres, var. 1. *squarrosus* Pers. as species, Warnst. in Die Europ. Torfm. p. 121 (1881).

In North America probably as widely diffused as in Europe; I have seen specimens from Greenland, collected by Spindler at New Herrenhut, from Miquelon Island (*Delamare*), from Lower Canada (*Pringle*), and from New Hampshire, Vermont and Massachusetts (*Faxon*).

Var. **spectabile** RUSS. in litt. 1888.

Branch leaves squarrose-spreading throughout.

Vermont, Westmore, 1,000 to 1,500 ft.; New Hampshire, Wh. Mts., 1,500 to 5,000 ft.; Massachusetts, N. Adams, 1,500 ft. (*Faxon*).

Var. **semisquarrosus** RUSS. in litt. 1888.

Branch leaves squarrose-spreading, either only in the lower part of the stem, or only in the middle part, or only in the upper part, but in the other parts of the stem appressed to erect-spreading.

Mitis, Lower Canada (*Pringle*); N. Hampshire, Crawford's, 1,900 ft., Profile Lake, 2,000 ft., Franconia, 1,200 ft. (*Faxon*).

This species is distinguished from the next by the robust construction of all its parts, by its monoicous inflorescence and by the form of the male branches and their perigonal leaves. The papillæ which occur on the inner walls of the hyaline cells of the branch leaves, so far as they are united to the chlorophyllose cells, are as variable as they are in the *CYMBIFOLIUM* group; sometimes they are distinct and numerous, sometimes small, faint and almost invisible. They are the best developed in the brown forms. Still another distinct European form, var. *imbricatum* Schpr., with everywhere appressed, or in part erect-spreading branch leaves, I have not yet seen from N. America.

21. *S. teres* AONGSTR. in Hartm. Skand. Fl. 8 ed., p. 417 (1861).

Syn.: *S. squarrosus*, var. *teres* Schpr. Entw. Gesch. der Torfm. (1858).

S. teres, var. 3. *gracile* Warnst. Die Europ. Torfm. p. 125 (1881).

N. Jersey (*Austin*); Miquelon Island (*Delamare*).

Var. **imbricatum** WARNST. in litt. 1888.

Branch leaves everywhere appressed, or partially erect-spreading.

N. Hampshire, Crawford's, 1,900 ft., Lisbon, 1,000; Mass., Dedham, 75 ft. (*Faxon*).

Var. **subsquarrosus** WARNST. 1888 in litt.

Branch leaves in part appressed or erect-spreading, in part squarrose.

Massachusetts, Dedham, 75 ft. (*Faxon*).

Var. *squarrosulum* LESQ. as sp. in Moug. et Nestl. Stirp. Crypt. Vog.-Rhen. No. 1305 (1854).

Branch leaves squarrose-spreading throughout.

California (*Brewer*); New Hampshire, Mt. Washington, 5,000 ft. (*Faxon*).

That *S. squarrosulum* Lesq. can not belong to the form-series of *S. squarrosulum* is surely proved by the dioicous inflorescence, as well as by the form of the male branches and their bracts which quite agree with *S. teres*.

IV. *Sphagna polyclada*.

22. *S. Wulfianum* GIRG. in Arch. Nat. Liv.-Est. und Kurl. 2. Ser. 2. p. 173 (1860).

Syn.: *S. cuspidatum*, var. *patens* Aongstr. MSS. Lindb. in Oefvers. V. Ak. Förh., p. 137 (1862).

S. pyenocladum Aongst. in Oefvers. V. Ak. Förh. p. 202 (1864).

Canada, New York, Greenland.

Var. **versicolor** WARNST. 1889 in litt.

Color, especially in the coma, a beautiful rose- or violet-red mixed with yellowish-green.

N. Hampshire, Franconia, 1,000 ft.; Vermont, Sutton, 1,000 ft. (*Faxon*).

Var. **viride** WARNST.

Whole plant grass-green, blanched at the base.

N. Hampshire, Franconia, 1,000 ft.; Mass., Dedham, 75 ft. (*Faxon*).

The position of this well marked species has been very differently understood by the various investigators. Sometimes it has been placed in the ACUTIFOLIUM group, sometimes in the CUSPIDATA, sometimes in the SQUARROSA; indeed, Limpricht in the Kryptogamen-fl. von Deutschland even refers it to the RIGIDUM group. It seems to me, however, that it belongs to none of the groups mentioned, but that, by its anatomical structure and especially on account of the numerous branches (6 to 13) in a fascicle, it represents a separate type among the *Sphagna*, to which I have in vain sought for an analogue among all the known species of the earth, although I have examined already about 200 established species. I therefore do not hesitate to consider *S. Wulfianum* as the only present representative of a separate group, the SPHAGNA POLYCLADA. The case is the same with *Sphagnum Aongstrøemii*, not yet met with in N. America, which also I account as the representative of a separate group, the SPHAGNA TRUNCATA.

It may have become known to North American bryologists that Russow and I have recently found, in *S. Wulfianum*, papillæ on the inner walls of the hyaline cells of the branch leaves, so far as they are united to the chlorophyllose cells. But little material of this magnificent species has hitherto been sent to Europe from N. America; for Cardot in *Rév. des Sphaignes de l'Amérique du Nord*, p. 16 (1887), says, "Je n'ai pas encore vu cette espèce d'Amérique." So much the greater was my surprise and joy on receiving from Mr. Edwin Faxon abundant and beautiful specimens of this moss.

V. *Sphagna rigida*

23. *S. compactum* DC. (LAM.) Fl. Franç., 3 ed. p. 443 (1805).

Syn.: *S. præmorsum* Z. D. Musc. Thuring. no. 18 (1821).

S. immersum Bryol. Germ. 1, p. 11 (1823).

S. ambiguum Hüb. Muscol. Germ. p. 25 (1833).

S. strictum Sulliv. Musc. Allegh. p. 49 (1846).

S. humile Schpr. MSS. Sulliv. in Mem. Amer. Acad. n. s., p. 175 (1849), according to Lindb.

S. rigidum Schpr. in Mem. sav. étrang. p. 72 (1858).

S. Garberi Lesq. et James in Proc. Am. Acad. XIV, p. 133 (1879).

California (*Bolander*); N. Jersey; Pennsylvania (*Rau*); Alabama; Florida; Miquelon Island (*Delamare*).

Var. *squarrosus* Russ. Beitr. p. 77 (1865).

In lax, deep tufts of a grayish or bluish green. Fascicles approximate or more remote. Spreading branches horizontal, more rarely curved downward, leaves loosely imbricated and squarrose. *S. Garberi*, of which I have examined specimens from the Kew Herb., certainly belongs here.

Pennsylvania (*Rau*) according to Cardot; Mass., Bedford, 100 ft. (*Faxon*).

Besides this I now distinguish two other varieties; var. **subsquarrosus** with generally but few recurved branch leaves, mostly erect-spreading, and var. **imbricatum** with closely imbricate branch leaves. The latter form usually produces very dense low tufts of different colors; the branches are comparatively short and much crowded.

Lindberg and Cardot cite *S. humile* Schpr. as a synonym of *S. compactum*, which does not seem to me correct. An original specimen, collected by Lesquereux in Carolina, which Schimper himself sent to Geheeb, is a very low (a few cm. high) undeveloped form of *S. molle* Sull., with few-

branched or even quite simple stems and squarrose leaves. A branch leaf, in cross section, shows the triangular chlorophyllose cells free on the inner side, characteristic of *S. molle*, whereas in *S. rigidum* they are elliptic, nearer to the outside, and on both sides completely included.

Neuruppin, Germany, Feb. 6, 1890.

Botanical papers at the Indianapolis meeting of the A. A. A. S.

The Indianapolis meeting was characterized by the great number of botanists and botanical papers in Section F. Of the 48 papers read before the section 28 were botanical. The series of papers upon the general subject of "The Geographical Distribution of N. Am. Plants" proved to be so successful that they were ordered printed in full in the volume of Proceedings, and will be issued also as a separate pamphlet reprint. Five of the seven papers assigned at the Toronto meeting were read, Professor C. S. Sargent being absent in Europe, and Professor John Macoun being engaged in exploration in the far northwest. Professors W. J. Beal and John M. Coulter, however, had papers upon geographical distribution, which were included in the series, making seven papers upon various divisions of the subject. It was also thought wise to prepare another botanical programme for the next meeting, to be held in Washington, D. C. The committee selected a physiological subject and made the following appointments: (1) The absorption of gases, by J. C. Arthur; (2) The aeration of aquatic plants, by W. P. Wilson; (3) The absorption of fluids, by L. H. Pammel; (4) The movements of fluids in plants, by W. J. Beal; (5) Transpiration, by Chas. E. Bessey.

John M. Coulter was elected vice-president of the section for the Washington meeting.

Following are the abstracts of the botanical papers read before the section at Indianapolis, many of which will appear in full in the botanical journals, government reports, and the volume of Proceedings of the Association:

Forest Trees of Indiana: STANLEY COULTER.—The author notes that the distribution of trees in Indiana depends upon the streams rather than upon latitude or elevation. The list contains 106 species and is characterized by the abundance of *Cupuliferæ* (24 spp.) and the paucity of *Coni-*